AGU 100 ADVANCING EARTH AND SPACE SCIENCE FALL MEETING
Washington, D.C. | 10–14 Dec 2018

SH51D-2848: What causes CME travel time estimation errors: their kinematic measurements in the corona or the limited understanding of the forces in their IP propagation?

Friday, 14 December 2018
08:00 - 12:20
Walter E Washington Convention Center - Hall A-C (Poster Hall)

The coronal mass ejections' (CME) time-of-arrival (ToA) estimates from the corona to 1 AU have been a topic of central interest due to the space weather phenomena associated with their arrival, such as intense geomagnetic storms. Several ToA estimates using kinematic input from white-light coronagraphs observations, both from a single and multi-viewpoint, have been made available, especially in the last decade. Despite of the development of many methods, ToA estimates errors are no better than 10 hours, on average. Our objective is to evaluate whether these discrepancies are associated with the limited analytical description of the forces acting on CMEs or with the improper kinematic input from observations. We took a set of well-observed CMEs from the Sun to 1 AU and investigate possible reasons for the discrepancies. We considered that the CME propagation is controlled by the aerodynamic drag due to the background solar wind and the Lorentz forces. We discuss the discrepancies caused in the travel time estimate due to drag force in CMEs whose background solar wind conditions (such as speed) change dramatically in the period from the CME release until its arrival at 1 AU. We also estimate a possible force associated with the interaction of CMEs with interplanetary structures such as corotating interaction regions. Back-of-the-envelope calculations suggest that typical magnetic field and particle density observed in these structures could significantly change the CME velocity and lead to ToA errors. (This work is funded by FAPESP, Sao Paulo Research Foundation, grant #2017/21270-7)

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